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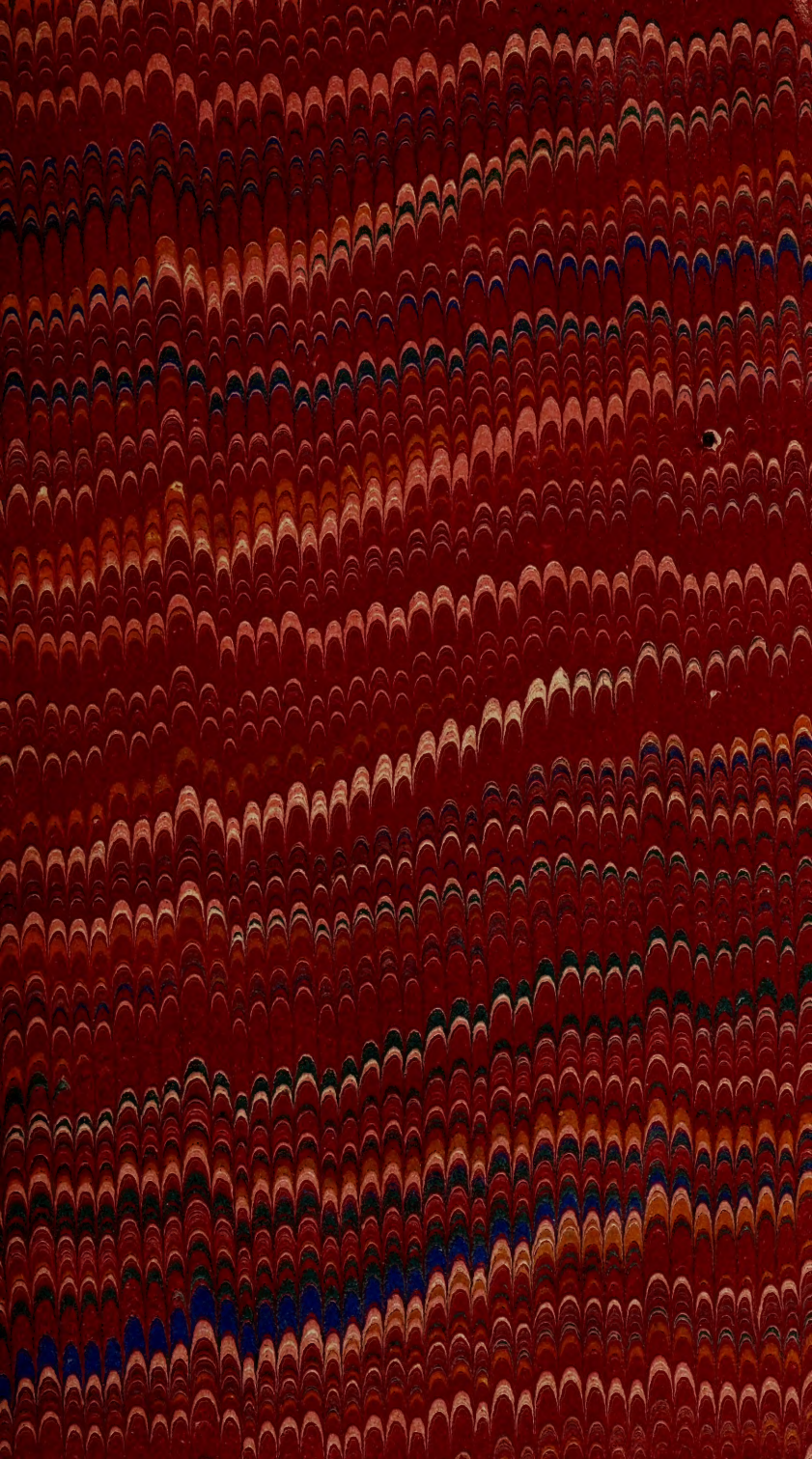
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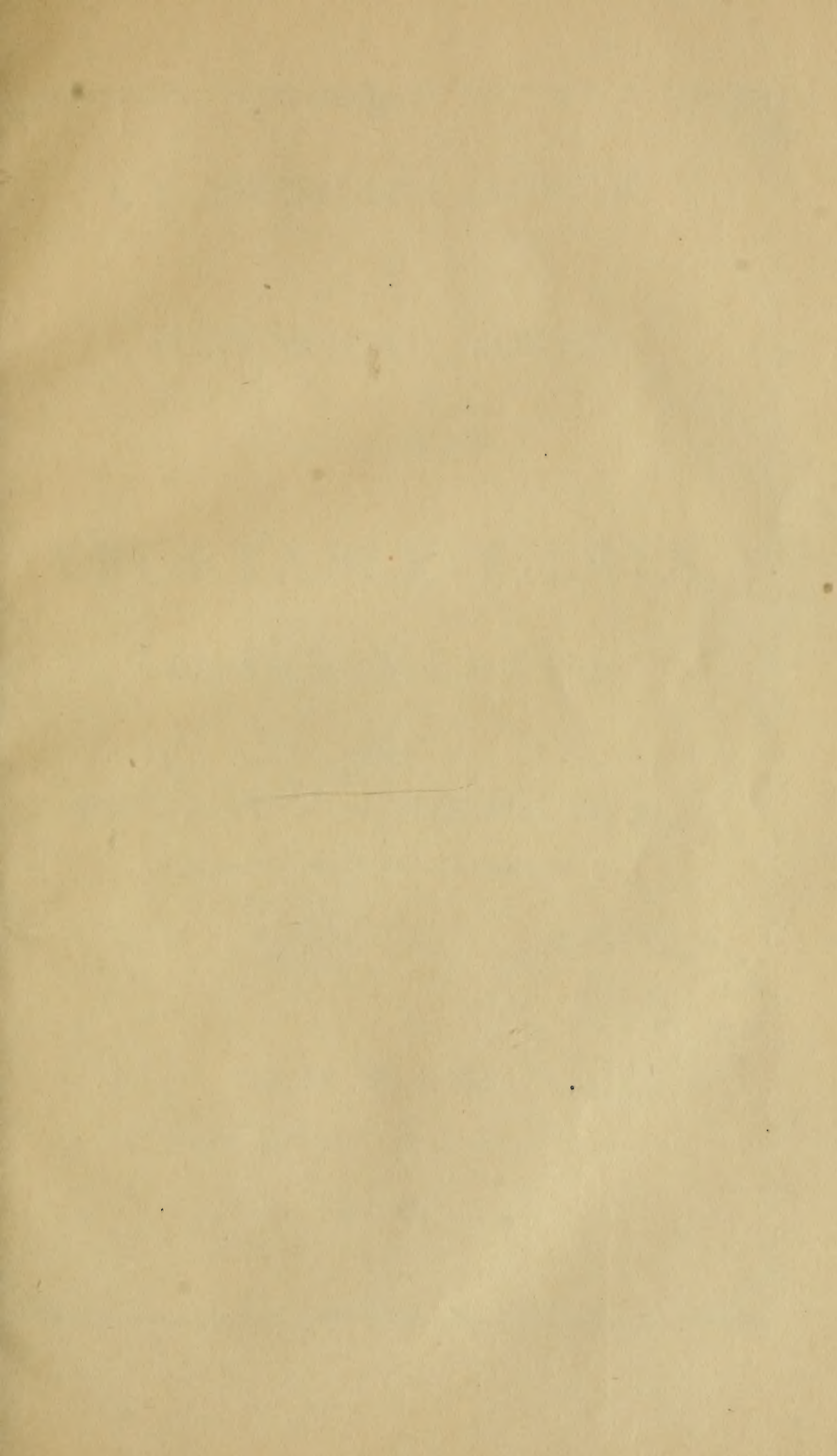
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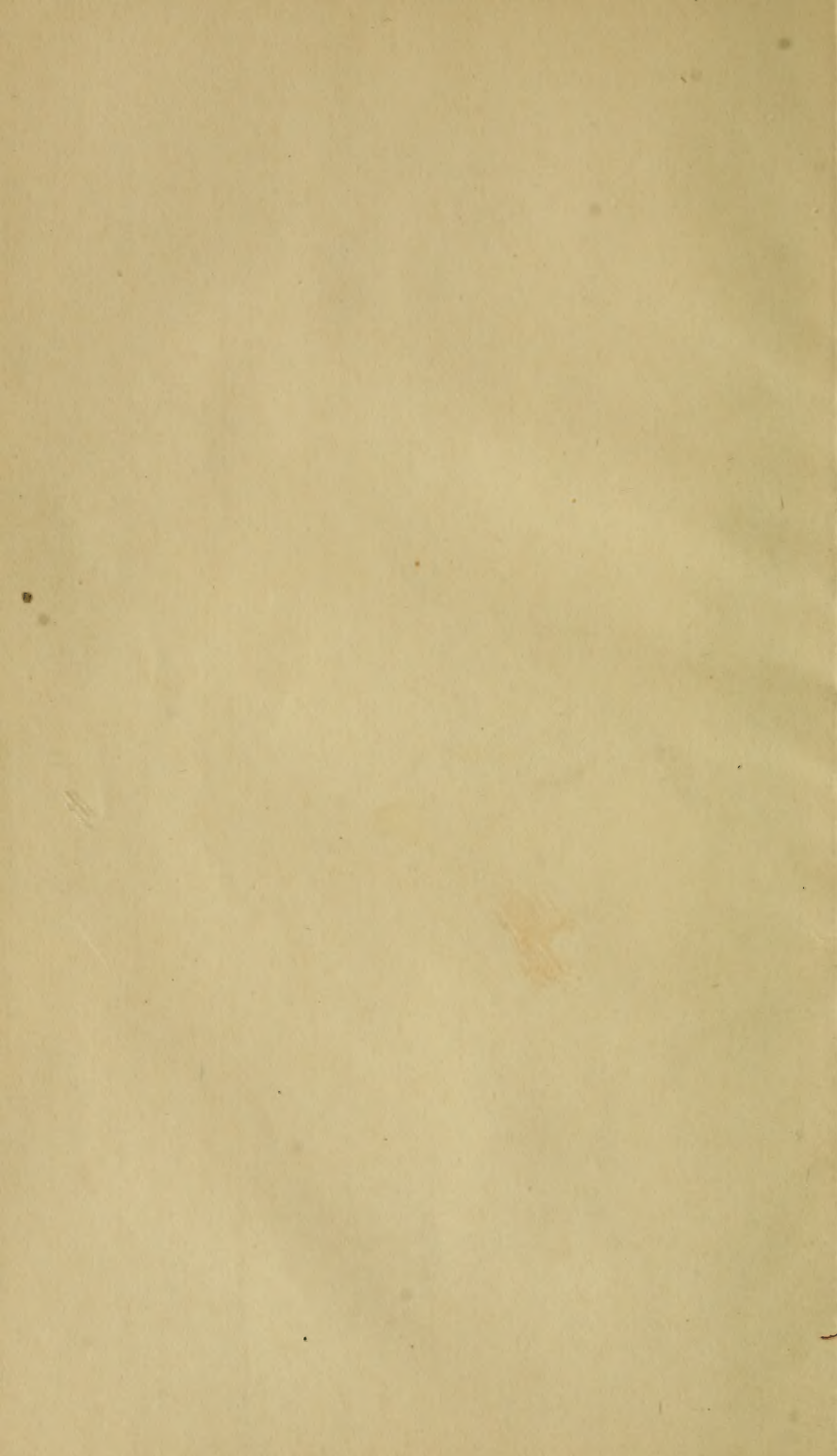
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9
U. S. INTERNATIONAL EXHIBITION.

HISTORICAL NOTES

CONCERNING THE

VEGETABLE FIBRES,

Exhibited by Severino L. da C. Leite ;

BY

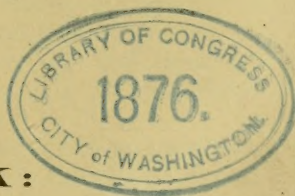
Coaguim
NICOLAU J. MOREIRA, M. D.,

Member of the Brazilian Commission.

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HISTORICAL NOTES

Relating to the Vegetable Fibres exhibited at the International Exposition, by Severino Lourenço da Costa Leite.

Under Official Notice No. 41 of the 22nd. of November, 1869, the Minister of Agriculture, Commerce and Public Works sent to the *Sociedade Auxiliadora da Industria Nacional*, in order to consult its opinion about them, some vegetable fibres which had been presented to him by Mr. Severino Lourenço da Costa Leite, residing at Sacramento Pequeno, on the Doce River, Parish of S. Domingos da Prata, in the Province of Minas Geraes.

The departments of Agriculture and Manufactures of the *Sociedade Auxiliadora da Industria Nacional*, although recognising the good quality of the fibres subjected to their examination, were of opinion, notwithstanding, that in order to obtain any profitable results, it was necessary to study the question, botanically and industrially, to learn the probable cost of a unity of weight, of each one of the species of fibres, in the exporting markets, the presumable result of the quantity produced upon a well defined and well cultivated area and, finally, to make experiments in its elasticity, resistance, etc.

Somewhat later, a remittance of the fibres prepared by Mr. Leite reached England and there, not only the celebrated botanist John Myers, but also a prominent manufacturer of Manchester, acknowledged that the qualities and adaptability for transformation by manufacturing of the Brazilian vegetable fibres, greatly exceeded those of hemp. The information which Mr. John Myers submitted to our legation in London is as follows:

Kensington, May 9th, 1872.

I have examined with a great deal of interest the samples

of the beautiful Brazilian fibre, which you handed me, in order to see if it could substitute cotton.

Upon this point, I will already give a decided negative, but, on the other hand, said material presents certain qualities of great value, which lead me to believe that it may be successfully employed in other species of textile fabrics.

To show you the reasons, on which this opinion is based, it is necessary to explain that in the manufacture of fabrics, three distinct classes of vegetable materials are employed. 1st., that which is only a down produced upon the hull of seeds, such as the well known cotton, that is preferred to all others on account of its softness and elasticity and of the facility with which it is spun; 2nd., materials which consist of fibres of wood taken from the branches and leaves of numerous tropical plants, such as the banana, which produces the Manilla hemp, from which they make the finest Indian muslins, and also the fibres extracted from the leaves of the aloes species, which produce the well-known Pita of Brazil, the Caruá, Gravatá, etc.: others from the palm-leaves, as Tucum and Carnahiba, both good for ropes, and the fibre from the seeds of the Cocoa, used for making large ropes for vessels, and some others, which, however cannot in general be woven because of the thickness and stiffness of the fibres; 3rd., which consists of very useful fibres only found inside the bark of trees or bushes; of these, hemp, Jute and the Rhea fibre are very much used in special manufactures and it is to this class that your noble Brazilian fibre belongs.

I should explain here, that cotton owes its great value to the quality of its down, which, seen through a microscope, seems to be a fine membrane, ribbon shaped, with a tendency to intertwine itself, by which its many points are easily interlaced, and from which results sufficient adhesion for its down to be converted into continuous, firm and fine thread. If cotton did not possess this quality, it would be useless, because of the shortness of the original down.

This quality, however, is peculiar to cotton, in the manufacture of which, in some parts of the world, especially in England, great numbers of special machines and enormous sums of money are employed.

On the other hand, the fibres of the 2nd class are composed of solid shreds, which are smooth, incapable of division or of being separately twisted; they owe their capability of being spun, when very fine, entirely to their great length, which in Manilla hemp measures 6 feet; it being an established fact, that the greater its length, the

greater its value. Some of them are, however, sufficiently fine and capable of being separated from the glutinous matter, to be used in fine textiles.

Finally, the fibres of the 3rd class, generated in the inside of the bark, are composed of what in botanical language are termed fascicular veins, and although they are often equal in length to the preceding species, their great merit consists in being able to be divided into numerous threads, which would be infinitely finer if they were not often clogged by resinous or other matters. The separation and division of this class of fibres depend upon different processes and different machinery, which vary according to the species of fibre; thus hemp requires to be soaked, carded, combed, bleached and an especial manner of spinning; and the manufactures from hemp have a greater or lesser value according to the perfection of the machinery employed. Among the fibres of this class, the best known in Brazil is the Guaxina, which although not equal to the Rhea fibre, would be preferred to Jute, if it were possible to obtain it in sufficient quantities and at a price which would attract the attention of the merchant, a consideration which carries us directly to the question of the probable price of your fibre, as an article of commerce.

The most important points to be verified, in the first place, are, if it is possible to produce the fibre in quantities sufficiently large and for a price reasonable enough to attract the attention of the manufacturer.

Supposing that these questions admitted of a favorable answer, it would be necessary to send a sufficient quantity of the fibre, in order to see whether it can be spun and woven in a factory by the machinery now in use, or whether it will require machinery especially constructed. For this purpose, at least a hundred weight would be necessary for each experiment. In case of a good result with the proper apparatus, we would afterwards consider the question of an adequate supply, which now appears quite problematical.

It would be impossible to rely on a supply, however moderate, of plants in a wild state, as they would soon be exhausted, if they were not cultivated on a large scale, and the demand for them would immediately cease.

I would like very much to see a specimen of the plant dried, with its leaves and flowers, as well as its fruit; from the branches sent, it is evident that it is a creeper, and I can form a tolerably good idea of the family to which it belongs, which leads me to doubt the possibility of its culture on a scale sufficiently great to furnish a prompt and

constant supply, all of which can be verified only by experience, and perhaps you can tell me if any such attempt has already been made in Brazil. I should like very much indeed, to obtain all the information you can furnish me in regard to it.

In the meantime I will use all my efforts to make the matter generally well known and to call the attention of the manufacturers to it.

I have carefully examined the fibre, which seems to have great capability; it is finer, softer and I believe stronger than fine flax.

A merchant of experience in fibres, to whom it was shown, estimated its value, in the supposition that it could be offered in large quantities, at £ 84 per ton or 9d. a lb., flax being worth to-day 6d. per pound, while ordinary cotton is worth 9 or 10d. per pound. This is certainly very encouraging.

I am, dear Sir, very truly yours,

JOHN MYERS.

To Mr. Pereira de Andrade.

London, May 13th, 1876.

I beg permission to correct a mistake which there was in my communication regarding your beautiful Brazilian fibre. I beg you to erase Jute 6d. per pound, substituting Flax 6d. per pound, Jute 2 $\frac{3}{4}$ d. a pound.

This comparatively low price of Jute, which is otherwise a beautiful strong fibre is due to its not being able to withstand the influence of moisture, as it immediately decays when exposed to it, a defect which makes it of little value when converted into cloth. If your fibre is equal to hemp in durability, when thus exposed, it will reach a much greater value than that which I gave it.

I am, dear Sir, yours faithfully,

JOHN MYERS.

To Mr. Pereira de Andrade.

As will be seen, in the opinion of the English manufacturers, the Brazilian vegetable fibres, although of excellent quality, would not meet with a demand in the European markets, unless the latter were certain that the necessary amount of materia prima for industrial purposes, would be furnished them.

To solve this problem, and, on the other hand, to study the culture of the plants, producing these species of vegetable fibres, comparing the practical difficulties which might offer

themselves in its preparation to those of the cultivation of other things, the Imperial Government deemed it proper, on the proposal of His Excellency the Visconde de Bom Retiro, to appoint a committee composed of the said gentleman, as chairman, and of Drs. Guilherme Schuch de Capanema, Nicolau Joaquim Moreira and Commander Joaquim Antonio de Azevedo, said committee to examine this branch of rural economy in the very place where the discoverer had commenced to cultivate the plant.

From the thorough study to which this committee devoted itself resulted a knowledge of the nature of these plants, of their easy acclimation, of the best seeds which may be obtained by the simple and inexpensive home culture in this instance, for these plants prosper quickly in any kind of soil, even though already exhausted, and in all climates.

The report of the committee is as follows :

Rio de Janeiro, Nov. 27th, 1872.

Honorable Sir :

The Committee appointed to examine the vegetable fibres offered by Mr. Severino Lourenço da Costa Leite, has the honor, in complying with the Official Notice from the Minister, of last July 25th, to offer to your consideration, the following result of its observations.

On examining them and the information previously given to the Government, this Committee is of opinion that nothing more is necessary to add in order to show the importance of preventing the dying in embryo of an industry so promising, and which if well managed, could in a few years make the plants well known among the most remarkable examples of such products, by the ease with which they are acclimated, and the improvement of the respective plants by cultivation; the simple and inexpensive manner of cultivating, of gathering the crop and of preparing the crude material; when flax, on the contrary requires so much labor and care; the rapidity with which the plants prosper even on land already long in cultivation, as the committee observed, and under the influence of any of our different climates, as the discoverer assures us, are certainly encouraging circumstances and more than sufficient to induce the government, with well grounded confidence to apply the means expected of it, for animating and promoting the development of this new and promising industry.

It is sufficient to consider that, according to the opinion of the English botanist, John Myers, the fibres contain certain

excellent qualities, being finer, softer and offering greater resistance than flax, and according to the valuation of the manufacturer, also English, to whom the botanist referred, they are worth £ 84 per ton or 9d. per pound, that is, 3d. more than flax and as much or nearly as much as ordinary cotton, the current price of which at the time was 9 to 10d. per pound.

Besides this, by the experiments made under the immediate observation of one of the members of the committee, Dr. Guilherme S. de Capanema, it was proved that one of the fibres, that of the lacteal vine, presented by the discoverer, really offers a far greater resistance and elasticity than flax and the fibre of the other plant also presented by the same gentleman, fully as much.

To these advantages must be added that the propagation of the plants from which the fibres subjected to our investigation were extracted, may be easily effected by means of cuttings; and, as for the lacteal vine, the committee saw it flourishing and developing itself perfectly among mango and other trees, interlacing its limbs and branches without injuring them in any manner.

From this results the not insignificant convenience which farmers and landowners may have, of cultivating these plants in their extensive and virgin forests, among the enormous trees, and, in this manner, derive great profits, preserving at the same time the valuable timber, without the sad necessity of destroying and injuring the soil by the application of fire, which must perhaps be done for other and less lucrative crops, that also require more attention and labor. In consequence of all this, this committee is of opinion that the discoverer of these fibres, who has cultivated for so long a time the respective plants, devoting himself to this object with perseverance and successive experiments, is worthy of the benevolence of the powers of State, and of the favors for which he hopes and which his state of poverty render so necessary. Upon this point, however, this committee begs leave to suggest in all due respect, that in its opinion, it is not by any means advisable to grant an exclusive privilege. On the contrary, it is of opinion that this new industry should be made as general as possible, by putting it in the power of the greatest possible number of cultivators who may wish to develop and perfect the same.

This would be the most certain means of establishing its general use in the shortest time, if, as may be hoped, the culture should practically yield the profits, which are reasonably probable. For this to be realized, it is, however,

indispensable that the introducer of the culture should be provided with the necessary means to commence immediately to extend the small plantation which he already has, and to develop it in a few years as much as it is possible for him to do.

Above all it seems advisable to exact of him, in view of what the English botanist John Myers appropriately suggested in his report, that some tons of the fibres exhibited in Manchester be immediately gathered, prepared and sent there, as the same botanist recommended, in order to determine if they can be spun and woven by the machinery now in use or if they require machinery of especial construction.

This precaution, is without doubt, of the greatest advantage in the study of the manner of manufacturing the product, and at the same time, of better observing what may occur in relation to the different uses to which it is put, thus preparing in advance a proper and certain market in Europe.

But this Mr. Leite is unable to do, as he has often declared, for want of means, and it is indispensable that he be at once aided with the necessary amount for the expenses of the working force which he will have to employ in the gathering and extracting the fibres, as well as those incurred for his subsistence and that of his family which he will be obliged to leave, when he goes to the woods, where he must remain the necessary length of time.

In the second place, he should be bound to extend the cultivation on a scale necessary to ensure a good exportation of the best fibres, by the end of the first two years from the date of the contract, which he will have to sign.

Without the certainty of cultivation on a large scale, the information received from England declares that a sure market cannot be relied upon. To attain this object Mr. Leite will immediately require some lands, and in case he should not find any one who may grant him such, he will be obliged to buy them. if the Government has none or cannot furnish them.

Having obtained the land, he will require laborers in a sufficient number, perhaps not less than 16 or 20 men, and besides, to care for their subsistence and for that of his family. It is consequently necessary to bear this circumstance also in view.

Besides this, it is advisable to bind Mr. Leite to make known which are the plants from which he extracts the fibres, the places where they are found, the manner and proper time to extract them, and, finally, to instruct those who may wish to attempt the new industry, in everything that may be necessary for this object, submitting to the

instructions which the Government may issue, in the faithful execution of his contract, under a monthly subsidy, which will enable him to pay all expenses and permit him to devote himself exclusively to this purpose during a certain number of years, never less than four.

At the end of such time, let him be entitled to a pecuniary reward corresponding to the results obtained.

If the latter are such as may be confidently expected, the empire gaining thereby still another source of income in its exports, he will deserve, without any doubt, such a reward; and the example will serve to animate others to dedicate themselves to the investigation of this and other products, which is so much needed in all the natural kingdoms in the vast regions which Brazil possesses, so rich in natural products in the larger part, but which are still neglected and even ignored.

We have the honor to be Your Excellency's most Obl. and Humble Servants.

VISCOUNT DE BOM RETIRO,
Chairman.

GUILHERME S. DE CAPANEMA.

NICOLÃO JOAQUIM MOREIRA.

JOAQUIM ANTONIO DE AZEVEDO.

To His Excellency Councillor Francisco do Rego Barros Barreto, Minister and Secretary of State for Affairs of Agriculture, Commerce and Public Works.

Examination of the vegetable fibres presented by Severino Lourenço da Costa Leite.

The textile fibres presented to the Committee by Severino Lourenço da Costa Leite, were three in number, and were extracted: 1st., from a lacteal vine; 2nd., from a vine of malpighiaceae; 3rd. from a palmtree.

Besides the latter, there were some filamentary products from the inner bark of several trees. As to the first, the Committee went to the place where some vines that produce it were cultivated and saw them growing luxuriantly, without any previous preparation of the soil; and some of the plants, though still young, had reached a length above eight metres and the area occupied by each one was about one square metre.

Mr. Leite declared that young plants yield 16 grammes to each foot, and full grown ones as much as 80, or, in the least favorable instance, 160 kilogrammes per hectare; admitting the value of flax to be 700 reis per kilogramme, as

Mr. Myers gives it, this quantity represents an income of 112 mil reis, with exchange at par, in the English markets.

A quantity of the fibres were extracted by the discoverer, in the presence of the committee, by an entirely rudimental process, which however was sufficient to demonstrate : 1st., that the manipulation is very easy and may be performed by simple machinery ; 2nd., that the fibre when extracted is in a state of purity and perfectly white, without requiring the application of chemical agents, more or less deleterious ; 3rd. that immediately after cutting, the vine, being submitted to an ingenious preparation, an invention of Mr. Leite, the fibres may and indeed should be at once extracted.

All the process of preparation is reduced to manipulations which require very little more labor than is required to gather gin, and card cotton ; in this respect the fibre of the lacteal vine presents a great superiority over flax.

It remains to prove whether it will admit of an advantageous comparison with flax, in point of tenacity.

For this purpose, direct experiments were instituted to determine the resistance to rupture of the elementary filaments that enter into the composition of the fibre, which is only a little bundle of filaments. This experiment was made in the following manner : a fibre of 2cm. in length was fastened at each end between two small vises, the upper one securely attached to a firm beam and the lower fitted to a scale for receiving weights, and the effects of the distention produced by the weights, were observed at a distance of 8 metres, through a telescope, magnifying 20 times. The vertical movement of the telescope was measured by a micrometre that permitted the reading of $1/2000$ of a millimetre.

The distension was always observed at the addition of two grammes to the weights, until the fibre broke.

The annexed table gives the comparative results of the experiments with the different fibres; the first column shows the weight in succession which each fibre supported, it being necessary to add $1\frac{1}{2}$ grammes—weight of the scale and vise which suspended it. The second and the third columns show the distension given by the difference in the two preceding observations. In the first experiment it was necessary to empty the scale at every successive 20 grammes, in order to substitute single weights ; in the second, this operation was performed only at every 40 grammes.

The second series of experiments was made with a quantity of the fibre, somewhat soiled and but slightly coherent, which was described as having been exposed to the sun and rain on a rock for four months ; it was submitted to an ex-

periment to show its state of preservation, and as it was a little scattered, it was necessary to employ a shorter one.

The experiment could not be concluded for with a weight of 68 grammes the fibre slipped and fell out of the apparatus.

The specimen of flax used in the comparative experiment, had been lately cultivated in Rio Grande do Sul and was still raw, not yet having been exposed to the bleaching process; it was consequently in its best state of resistance.

Passing on to compare the results of the experiments, it is evident that each elementary filament of which the fibre is composed, presents a very different degree of resistance, according to the nature of the vegetable substance and in following proportion.

Young lacteal fibre	14.6	and upwards.
Old lacteal fibre.....	9.4	
Fibre of malpighiacea.....	5.4	
Raw flax fibre	5.3	

From this we conclude that the fibre of the vine presented by Mr. Leite is nearly three times stronger than flax; even after being used it seems to lose very little of its strength. The fibre of the Malpighiacea which Mr. Leite designated as a species of hemp is as strong as flax, but one circumstance must be considered, which is, that two of the filaments composing the fibre under experiment were thinned out to fineness and terminated in a point; they were the ends of the filaments and therefore do not represent the integral strength.

As to the elasticity which must also be considered, in treating of materials for spinning and weaving, it is seen that at the moment before breaking, the percentage of its length amounts to the following:

Lacteal fibre	3.70 p. c.
Fibre of Melpighiacea.....	1.90 “
Flax fibre.....	1.00 “

Comparing the elasticity under the immediate weight to that which broke the flax fibre (32 grammes), we have.

Flax fibre.....	1.00 p. c.
New lacteal fibre.....	1.10 “
Old lacteal fibre.....	1.60 “
Fibre of Malpighiacea.....	1.80 “

Of the two lacteal fibres under the weight of 66 grammes, at which it was necessary to stop the second experiment, the elasticity was for

New fibre.....	2.40 p. c.
Old fibre.....	1.70 “

Whence we see that the used or old fibre had gained some elasticity.

We proceeded to examine the structure of the fibres compared, as represented in the drawings of them in the annexed pages under Nos. I, II, III, giving the appearance they make under the microscope magnified 300 times in diameter.

It is seen that the fibres used in the experiment were of the following diameter:

	<i>m/m.</i>
Flax	0'126
Lacteal fibre	0'063
Fibre of Malpighiacea	0'056

The filaments that compose the fibre vary considerably.

Of the lacteal fibre..... 0'013 to 0'026

Of the flax..... 0'010 to 0'013

Of the fibre of Malpighiacea..... 0'010

The flax fibre appears to have a greater diameter from its being some what flattened whilst the others are rounding.

All of them prove considerable coherence in the old lacteal fibre which shows the filaments entirely separated and clean, whilst the new shows some adherent granules mostly knotted or intertwined.

The flax filaments are found to be covered with strongly adherent granules so as to form a crust, as is seen in Tab. II fig. 1, and fig. 2 and B.

The filaments of the Malpighiacea fibre are clean as seen in Tab. III.

The filaments of the flax and Malpighiacea have thick walls with a narrow lumina. Tab. II fig. 2 B. and Tab. III fig. 3.

Those of the new lacteal fibre scarcely leave the lumina perceptible by a narrow dark streak, Tab. I fig. 2 and B., whilst in the old lacteal fibre it appears more empty, Tab. I, fig. 5.

The lacteal fibre is continuous, very rarely attenuated, and many of its filaments have spiral irregularities and sometimes in two ways, so that its surface appears covered with a net whose meshes are elongated rhombs. This irregularity may perhaps contribute to give greater coherence to the threads produced from this fibre, but it is also probable it will be overcome in the spinning, because it was not observed except in the fibres taken from the plant without having had to support any weight.

The fibres of flax and Malpighiaceae are composed of shorter filaments which become finer towards the points and overlap (Tab. II fig. 2, and Tab. III fig. 4), which must diminish their strength.

As to breaking, it is very irregular in flax, Tab. II fig. 3; it seems to show the existence of weak points in different parts whilst in the fibres of the Malpighiaceae, Tab. III fig. 3 and 4,—it is transversal and in only one place; fig. 3 and 4 represent in the breaking, a tendency to ravel, in fig. 3 we can see the spiral irregularity above mentioned, and which is undoubtedly an indication of a very peculiar construction of the filaments which explains its great strength and considerable elasticity.

Some of the lacteal fibres of the plant present to the naked eye, at short intervals, ends more distinct and more imbedded, with the appearance of knots; from this a weakening might result but it does not prove to be so, for when examined with the microscope, these points are found to be folds or kinks of all the filaments of the fibre without interruption of their continuity as is seen in Tab. I fig. 7. The fibre of the Malpighiaceae presents similar phenomena. Among the lacteal fibres which constitute the middle bark and contained in the woven layer, are found flat strips similar to cotton, Tab. I fig. 6.

It is necessary to observe that the milky juice conveyed by these fibres coagulates, producing a white substance, more brittle than elastic, with the properties of resin and not of India rubber or Gutta-percha, as in many others, even of the same family.

From the above it is evident that the fibre of the lacteal plant presented by Mr. Severino Lourenço da Costa Leite, shows: 1st, strength and elasticity in a much higher degree than flax; 2nd, that these properties are due to a special texture; 3rd, that its preparation and culture are easy and must therefore be very lucrative.

As to Malpighiaceae, it compares advantageously with flax. Its cultivation is easy; and the production of the fibre depends upon an operation involving little labor and which facilitates the gathering of the crop and is an invention of Mr. Leite.

In regard to other preparations, either from the palm trees or from various others, special studies have not been made. But it is worthy of mention in regard to these trees that not only can the filamentous middle bark be applied to industry but also the very wood itself can be used instead of

rags in the manufacture of paper, and this with great advantage.

VISCOUNT OF BOM RETIRO,
Chairman.

GUILHERME S. CAPANEMA.
NICOLAU JOAQUIM MOREIRA.

At the National Exposition which took place in Rio Janeiro in 1873 the vegetable fibres, prepared by Mr. Severino Leite, made a brilliant figure and being afterwards sent to the international Exposition of Vienna they won there the attention of the Belgian and English industry which subjected them to various experiments and prepared from them different fabrics. There are now exhibited in the Palace of the Exposition these fibres, already known, accompanied by various other species, in regard to which the eminent and able Dr. José Saldanha da Gama expresses himself in the following manner:

“Gold is that which is worth gold, we said to Mr. Leite, when we had finished examining the textile products from the Province of Minas Geraes, exhibited by him. One of these deserves preference in any treatise relating to extractive industry; it will be the subject of many exclamations at Philadelphia and later on, of much demand, then of extensive introduction. In our humble opinion the exceedingly rich and highly important collection of the indefatigable native of Minas Geraes is one of the glories of the present exposition.

Seven qualities, of which six are specifically different, are the only cause of the murmur that is heard at times in the hall for the products of Minas Geraes. There was given to us a little specimen of each species for study; we ascertained the existence of a reaction of the isolated fibres and the results obtained by us will be herein enclosed, expressing the approximate values.

First.—The lacteal vine possesses all the characteristics of the true *asclepiadacea* (however much we might wish to call it *ortiga!*). The crude filaments as well as the carded threads are of an admirable whiteness and of unusual tenacity. This useful vine grows spontaneously on the Doce river in the District of Santa Barbara in the province of Minas Geraes, and now through well understood culture, the province of Rio Janeiro possesses a large number of plants of this species.

The soil does not delay after receiving into its fertile bosom the seeds of this highly useful vine; at the end of two

years the farmer gathers lateral fibres and sprouts, passing them through the hackles in the interior of a special machine. If on an acre of land the crop is enlarged to 120,000 plants of the lacteal vines, according to the teachings of experience and if each one produces thirty grammes of bark fibres from its respective *cortex*, it follows that from one acre of land the yield of the textile material must be computed at 3,000,000 grammes. The farmer loses on each vine scarcely 25 p. c. of threads which is nothing, comparing this disadvantage with the results of the crop.

The vines grow to 100 feet in height, entwining themselves around the trunks of the trees on the Doce river.

With the aid of a lens and a fine needle we are certain of having completely separated the threads whose tenacity we can represent by the following figures :

The first experiment gave us 140 grammes for the maximum in the spinning ; the second, 150 and three more experiments resulted the same way which brings us to the conviction of a rare fact in regard to the strength of fibres of vegetable origin. In the meantime these statistics will serve to confirm the judgement formed in Belgium about the unquestionable value of this precious vine ; handkerchiefs and other small articles have been manufactured there and the experiments crowned with the most brilliant results. In England they have also subjected it to a series of experiments so far as to be able to estimate the high price of the fabrics.

What is wanting for the extension of this immense product of the Brazilian soil ?

It is necessary that the government should entertain the idea of sending some one to the United States with many bales of the textile substance of the lacteal vine for the purpose of taking advantage of the concurrence at Philadelphia, and transforming it into beautiful fabrics in the American factories, and then to exhibit them to the entire world. There, it will be said among other things that the fibre of the vine *asclepiadacea* exposed during four months day and night, to the inclemency of the weather lost not even a single gramme from the figures denoting its strength.

Second. A palm-tree, whose name is unknown, growing on the Doce river, in the District of Santa Barbara, furnished a motive for the exercise of the activity of the indefatigable exhibitor. From the leaves and petals there came filaments which seen in a mass, have the appearance of wool. Separating them with extreme care we found their value in strength to be

In the first experiment, 50 grammes ; in the 2d., 45 ; in the 3d., 59 ; in the 4th., 22 and in the 5th., 30. Average value about 40 grammes. Factories should be considered fortunate to be able to count it in their treasury of *materias primas*.

Third. Now in regard to the appearance of two products of one and the same palm-tree, Iriuba, Iri or Brajauva. On one side we appreciate the beautiful specimen of fibres taken from the yellowish colored leaves, in every respect similar in appearance to the wool of the *Tucum* of Brazil. This seems to be the true vegetable wool, more so, than the preceeding ; if tried in the weaving machines it is certain the effects would not be negative. There are the details of the experiments : 1st., 59 grams. ; 2d., 40 ; 3d., 50 ; 4th., 40 ; 5th., 38. Average about 43 grammes..

Fourth. On the other hands specimens are seen, white and light, formed in the intervals of the joints of narrow lamina or stalk in the language of the exhibitor ; it is sufficient to run a steel blade or one of thin wood between the straws of the plant for the immediate appearance of the light fibres, different in color and aspect, yet the product of the same palm-tree, Iriuba. We have then the two qualities of fibres from one and the same species, the last being more tenacious as seen from the following experiments :

1st. experiment, 45 grammes ; 2nd., 40 ; 3rd., 40 ; 4th., 60 ; 5th., 60. Average : 49 grammes.

Fifth.—There is on the Doce river a celebrated tree, commonly called “wild fig” a species of the *gamelleira* (*Ficus*) whose milk contains India Rubber and whose bark is worthy of notice. The trunk leaves or stalk leaves although they cannot be separated into distinct fibres, nevertheless offer an interest not less industrial. By soaking them the leaves come out whole ; when introduced between iron cylinders in consequence of the compression suffered they become very thin, yet preserving a remarkable width and length. In this condition, to say nothing of their being objects of curiosity, of innovation or pauperism, it is possible to transform them into thick garments for country-laborers or for any other workmen. But what it is well to affirm here, is its acceptance in Belgium. The primitive paper of the fig tree of Minas Geraes was formed into fine writing paper. Without further preparation letters and official documents are written on the precious bark of the rich tree of the Doce river. Mr. Severino Leite declares that he has taken from one tree 275 *covados* (206 yards) of bark sheets of three fourths of a yard in width.

A new mine for industry.—This fig tree is propagated easily by cuttings, owing to the rapid development of the adventitious roots.

Sixth.—Let the visitor pause before the red vine (*Malpighiaceae*) *red*, that is, the color impregnated in the fibre by the natural dye of the vine as the process of extraction proceeds.

It grows in the dry land, climbs up the trees or trails on the ground: it produces a quantity of gum; the yield in fibres is copious; the experiment show that the cords do not break for want of tenacity: 1st., 50 grams.; 2d., 45; 3d., 50; 4th., 42; 5th., 15. Approximate average, 16 grams.

Seventh.—Finally *cipó preto*, or black vine, which will attract the attention of the public, from the appearance of twisted thread, owes its accidental black color to the dye of the same plant, which dyes the shreds when drawing out the cortical fibres. This vine is found in the swampy parts of the province of Minas Geraes, comprehending a vast area of vegetation. Is it also a *Malpighiaceae*? Its resistance is as follows: 1st. experiment, 40 grams; 2nd., 37; 3rd., 40; 4th., 35; 5th., 45. Average, 39 grammes.

Comparing the averages of the 6 fibres the reader can estimate the strength of the lacteal vine, mentioned in the first place.

This part of our studies being concluded, we will repeat an idea already suggested sometime ago by a person capable of judging: the richest and most beautiful show case which perhaps can be constructed in the workshops of Rio Janeiro, should be destined for the textile fibres of Mr. Leite. In Rio Janeiro or in Philadelphia, the men versed in these matters will place in a conspicuous position the distich: "Second Triumph achieved by the Empire of Brazil."

New York, March, 1876.

DR. NICOLAU J. MOREIRA.



at 38 grammes 1.90 p. c.
Resistance per fila-
ment 5.4.

30	"	8.981	1.022	"	9.533	0.447
2	"	8.978	1.025	"	9.551	0.449
4	"	8.980	1.023	"	9.550	0.450
6	"	8.980	1.023	"	9.550	0.450
8	"	8.980	1.023	"	9.548	0.442
60	"	8.980	1.023	"	9.551	0.440
The fibre slipped out of the apparatus 7 filaments.						
60	10.000	8.976	1.024	"	9.548	0.452
2	"	8.977	1.023	"	9.549	0.451
4	"	8.975	1.025	"	9.549	0.451
6	"	8.976	1.024	"	9.548	0.452
8	"	8.977	1.023	"	9.548	0.452
70	"	8.980	1.020	"	9.548	0.452
2	"	8.977	1.023	"	9.548	0.452
4	"	8.976	1.024	"	9.548	0.452
6	10.002	8.979	1.024	"	9.548	0.452
8	10.001	8.976	1.025	"	9.548	0.452
80	10.001	8.975	1.026	"	9.548	0.452
The resistance per filament exceeds 9.4.						
80	10.000	8.970	1.030	"	9.548	0.452
2	"	8.972	1.028	"	9.548	0.452
4	"	8.972	1.028	"	9.548	0.452
6	"	8.972	1.028	"	9.548	0.452
8	"	8.968	1.032	"	9.548	0.452
90	"	8.970	1.030	"	9.548	0.452
2	"	8.968	1.030	"	9.548	0.452
4	"	8.968	1.032	"	9.548	0.452
6	"	8.970	1.030	"	9.548	0.452
8	"	8.960	1.030	"	9.548	0.452
100	"	8.969	1.031	"	9.548	0.452
3	"	8.963	1.037	"	9.548	0.452
4	"	8.963	1.037	"	9.548	0.452

Elasticity:
at 32 grammes..... 1.10 p. c.
at 66 grammes..... 2.40 p. c.
at 102 grammes..... 3.70 p. c.
Resistance per filament.

LACTEAL FIBRE.

FLAX.

MALPIGHIACEA.

New

Old

Micrometre.

Micrometre.

Micrometre.

Micrometre.

GRAM.	HIGHEST	LOWEST	DIFF.
0	10'000	9'000	1'000
2	"	"	"
4	"	"	"
6	"	8'992	1'008
8	"	8'988	1'012
10	"	8'988	1'012
12	"	8'988	1'012
14	9'997	8'985	1'012
16	9'997	8'985	1'012
18	9'998	8'981	1'017
20	10'000	8'982	1'018

HIGH.	LOW.	DIFF.
9'992	8'992	1'000
9'993	8'993	1'000
9'992	8'992	1'000
9'991	8'991	1'000
9'989	8'980	1'009
9'987	8'985	1'002
9'987	8'983	1'004
9'987	8'980	1'007
9'980	8'976	1'004
9'981	8'976	1'005
9'982	8'978	1'004

HIGH.	LOW.	DIFF.
10'000	8'998	1'002
9'993	8'002	0'991
9'996	8'001	0'996
9'993	8'007	0'986
9'997	8'998	0'999
9'998	8'999	0'999
9'997	8'997	1'000
9'997	8'995	1'002
9'998	8'993	1'005
9'998	8'993	1'005
9'997	8'991	1'006

20	10'000	8'990	1'010
2	"	8'9'8	1'012
4	"	8'988	1'012
6	"	8'988	1'012
8	"	8'989	1'011
30	"	8'988	1'012
2	"	8'989	1'011
4	"	8'987	1'013
9	"	8'986	1'014
8	"	8'986	1'014
40	"	8'985	1'015

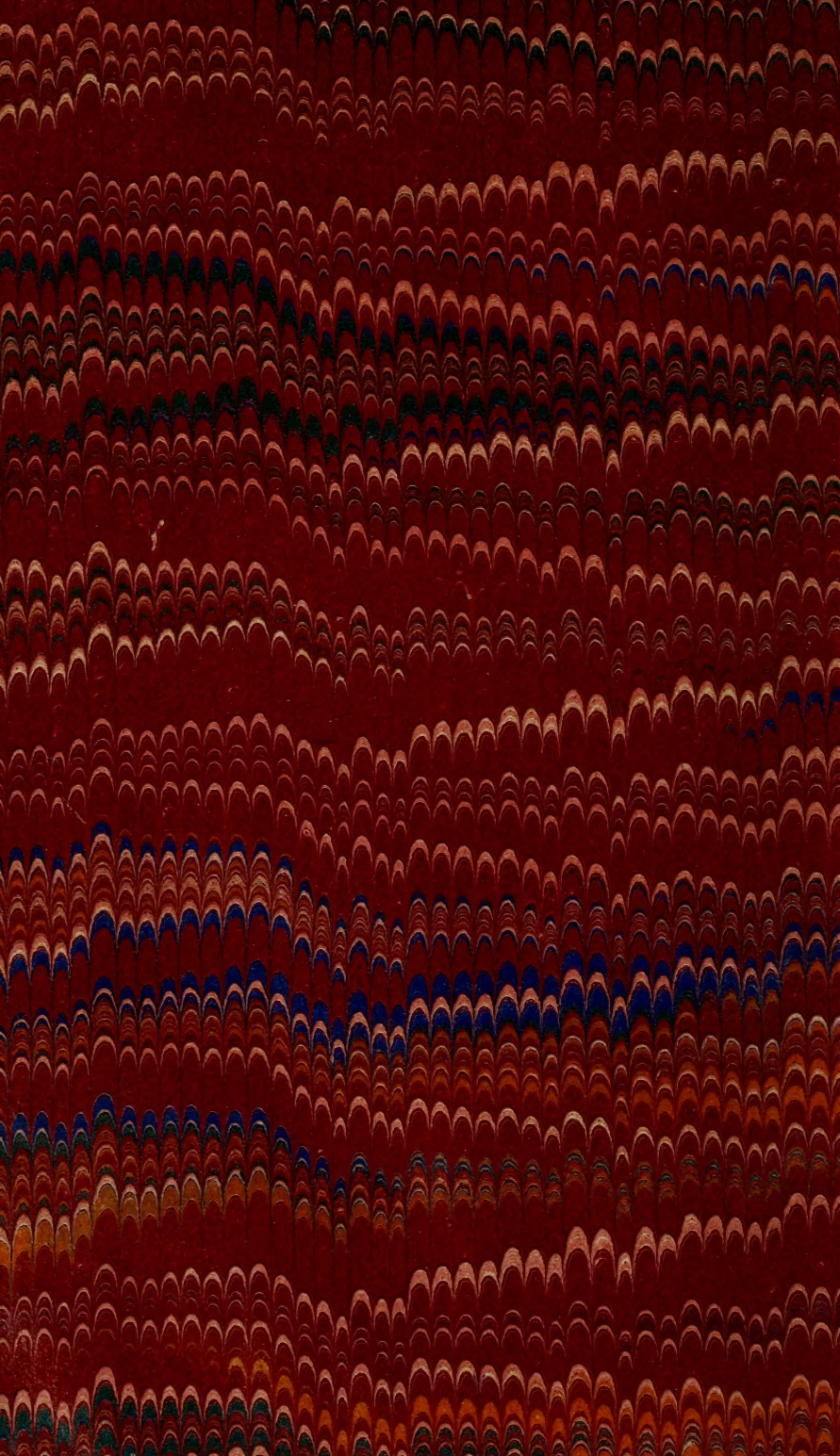
20	10'000	8'990	1'010
2	"	9'561	0'439
4	"	9'558	0'442
6	"	9'557	0'443
8	"	9'560	0'440
30	"	9'560	0'440
2	"	9'557	0'443
4	"	9'558	0'442
9	"	9'555	0'445
8	"	9'556	0'444
40	"	9'555	0'442

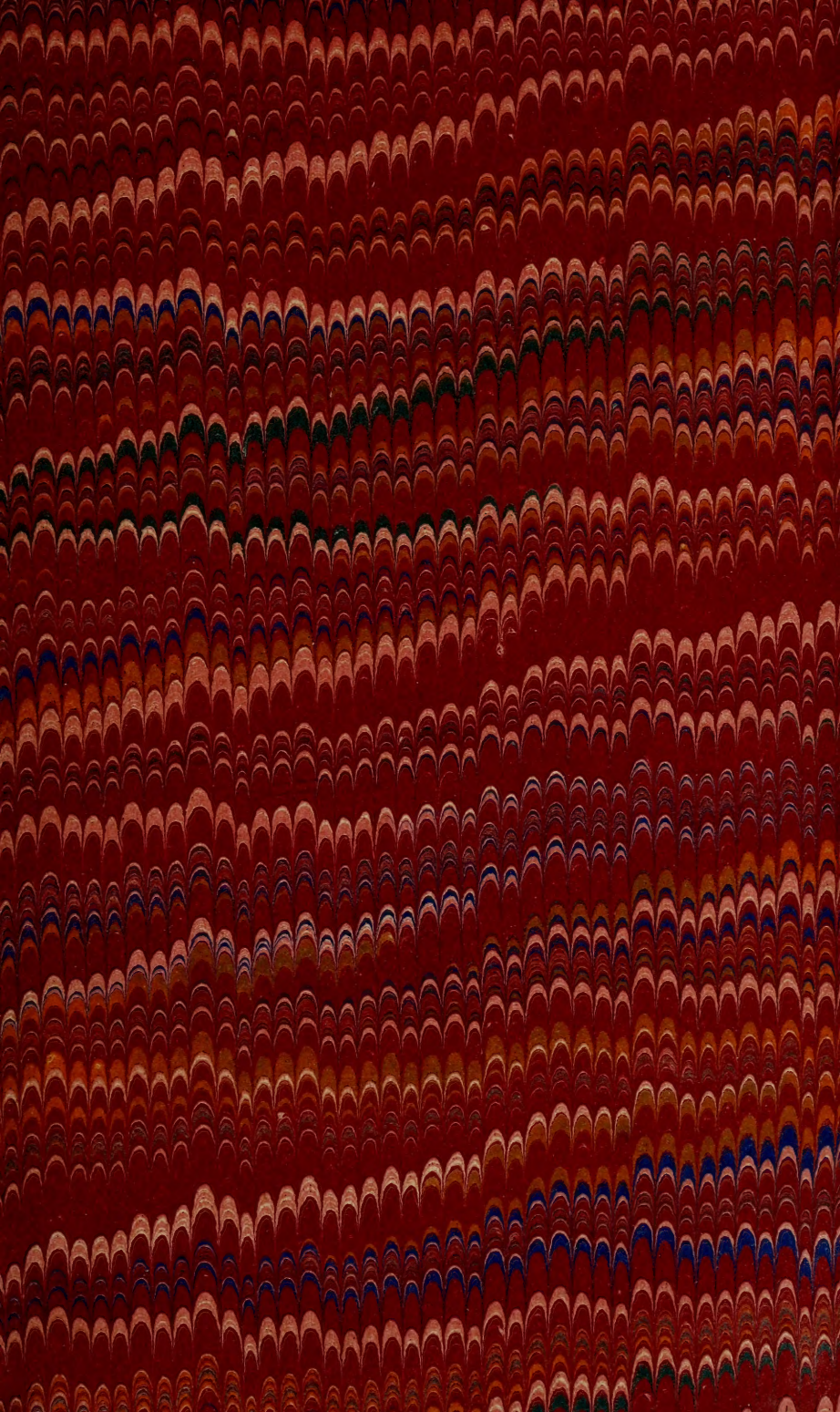
20	10'000	8'990	1'010
2	"	9'998	8'988
4	"	9'996	8'988
6	"	9'996	8'989
8	"	9'994	8'986
30	"	9'996	8'986
2	"	9'997	8'983
4	"	5'295	8'982
9	"	9'996	8'983
8	"	9'996	8'981
40	"	9'996	8'981

6 filaments breaking.
Elasticity: 10 p.c.
at 32 grammes per filament
Resistance per filament 53.

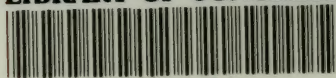
7 filaments breaking.
Taking as primitive length, the average of the first 10, which is







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